

CHAPTER : ELECTROCHEMISTRY

BAB 6: ELEKTROKIMIA

ANSWER MODUL CEMERLANG

JAWAPAN MODUL CEMERLANG

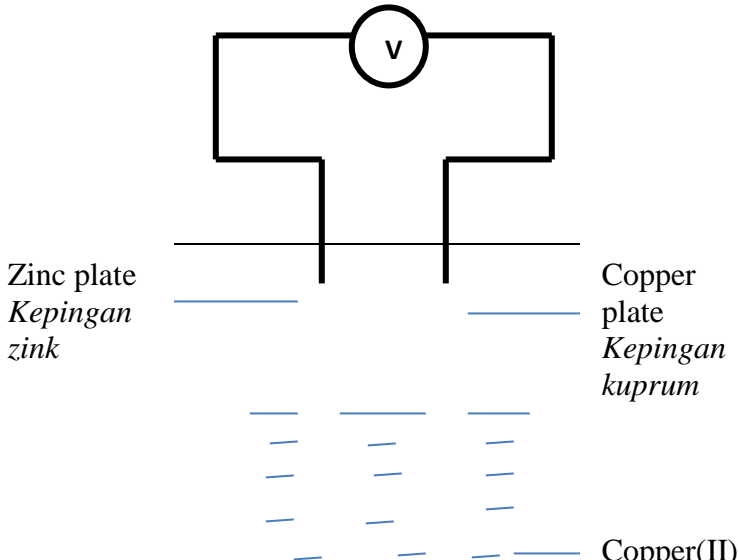
1	C	6	D	11	A	16	B	21	A
2	C	7	A	12	D	17	B	22	B
3	A	8	C	13	A	18	A	23	C
4	B	9	D	14	C	19	C	24	A
5	A	10	D	15	A	20	A	25	C

Question No			Mark Scheme	Mark	
				Sub	Total
1	(a)	(i)	Anode : X <i>Anod : X</i>	1	2
			Cathode : Y <i>Katod : Y</i>	1	
		(ii)	Electrical energy to chemical energy <i>Tenaga elektrik kepada tenaga kimia</i>	1	1
	(b)	(i)	Copper(II) ion/ Cu^{2+} ion, chloride ion, Cl^- ion, hydrogen ion/ H^+ ion and hydroxide ion/ OH^- ion <i>Ion kuprum(II)/ ion Cu^{2+}, ion klorida/ ion Cl^-, ion hydrogen/ ion H^+ dan ion hidroksida/ OH^-</i>	1	1
		(ii)	X : Cl^- , OH^-	1	2
			Y : Cu^{2+} , H^+	1	
		(iii)	Brown solid is deposited/thicker <i>Pepejal perang terenal/menebal</i>	1	1
		(iv)	$\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$	1	1
	(c)	(i)	Oxygen <i>Oksigen</i>	1	1
		(ii)	Insert glowing splinter in the mouth of test tube. <i>Masukkan kayu uji berbara ke dalam mulut tabung uji.</i>	1	2
			It will light-up/rekindles <i>Kayu uji berbara menyala.</i>	1	
	(d)		Concentration of copper(II) chloride solution <i>Kepekatan larutan kuprum(II) klorida</i>	1	1
Total marks					12

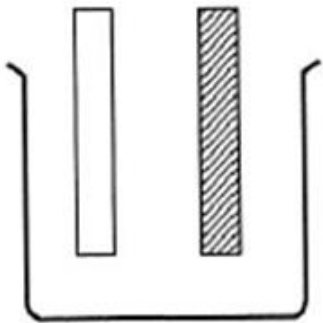
Question No			Mark Scheme	Mark	
				Sub	Total
2	(a)		Electrical energy to chemical energy	1	1

		<i>Tenaga elektrik kepada tenaga kimia</i>			
	(b)	(i)	Brown solid deposited/thicker <i>Pepejal perang terenap/menebal</i>	1	1
		(ii)	$\text{Cu}^{2+} + 2\text{e} \longrightarrow \text{Cu}$	1	1
		(iii)	From +2 to 0 <i>Daripada +2 kepada 0</i>	1	1
	(c)	Oxygen gas. <i>Gas oksigen.</i> Insert the glowing wooden splinter into the test tube. The glowing wooden splinter relight. <i>Masukkan kayu uji berbara ke dalam tabung uji. Kayu uji berbara menyala.</i>		1 1	2
	(d)	Blue colour of copper(II) sulphate solution fades because <i>Warna biru larutan kuprum(II) sulfat pudar kerana</i> the concentration of Cu^{2+} ion in the solution decreases. <i>kepekatan ion Cu^{2+} dalam larutan berkurang.</i>		1 1	2
	(e)	Copper(II) ion <i>Ion kuprum(II)</i> because copper release two electrons <i>kerana kuprum melepaskan dua electron.</i>		1 1	2
Total marks				10	

Question No			Mark Scheme	Mark	
				Sub	Total
3	(a)	(i)	Cu^{2+} , H^+ , SO_4^{2-} , OH^-	1	1
		(ii)	Brown solid deposited <i>Pepejal perang terenap</i>	1	1

		(iii)	<table><tr><th>Experiment <i>Eksperimen</i></th><th>Product formed at anode <i>Hasil yang terbentuk di anod</i></th><th>Factor that affect the product formed at anode <i>Faktor yang mempengaruhi hasil yang terbentuk di anod</i></th></tr><tr><td>I</td><td>Oxygen gas <i>Gas oksigen</i></td><td>Concentration of electrolyte <i>Kepekatan elektrolit</i></td></tr><tr><td>II</td><td>Copper ion(II) <i>Ion kuprum(II)</i></td><td>Type of electrode <i>Jenis elektrod</i></td></tr></table>	Experiment <i>Eksperimen</i>	Product formed at anode <i>Hasil yang terbentuk di anod</i>	Factor that affect the product formed at anode <i>Faktor yang mempengaruhi hasil yang terbentuk di anod</i>	I	Oxygen gas <i>Gas oksigen</i>	Concentration of electrolyte <i>Kepekatan elektrolit</i>	II	Copper ion(II) <i>Ion kuprum(II)</i>	Type of electrode <i>Jenis elektrod</i>	1+1 1	3
Experiment <i>Eksperimen</i>	Product formed at anode <i>Hasil yang terbentuk di anod</i>	Factor that affect the product formed at anode <i>Faktor yang mempengaruhi hasil yang terbentuk di anod</i>												
I	Oxygen gas <i>Gas oksigen</i>	Concentration of electrolyte <i>Kepekatan elektrolit</i>												
II	Copper ion(II) <i>Ion kuprum(II)</i>	Type of electrode <i>Jenis elektrod</i>												
		(iv)	$\text{Cu} \longrightarrow \text{Cu}^{2+} + 2\text{e}$	1	1									
		(v)	Experiment II. <i>Eksperimen II.</i> Number of Cu^{2+} ion discharged at cathode is the same as the number of Cu atom ionizes to form Cu^{2+} ion at anode. <i>Bilangan ion Cu^{2+} yang dinyahcas di katod adalah sama dengan bilangan atom Cu mengion membentuk ion Cu^{2+} di anod.</i>	1 1	2									
	(b)	<div><p>Zinc plate <i>Kepingan zink</i></p><p>Copper plate <i>Kepingan kuprum</i></p><p>Copper(II) sulphate solution <i>Larutan kuprum(II) sulfat</i></p></div>		1+1	2									

@JU KIMIA PERAK

					
Total marks				10	

Question No			Mark Scheme	Mark	
				Sub	Total
4	(a)		Chemical cell/Voltaic cell <i>Sel kimia/ Sel voltan</i>	1	1
	(b)		Chemical energy to electrical energy <i>Tenaga kimia kepada tenaga elektrik</i>	1	1
	(c)		$2\text{H}^+ + 2\text{e} \longrightarrow \text{H}_2$	2	2
	(d)		Galvanometer//Voltmeter//Miliammeter//Bulb// EC meter (Electrical conductivity meter)	1	1
	(e)	(i)	Copper/Cu//Silver/Ag//Lead/Pb//Tin/Sn <i>Kuprum/Cu//Argentum/Ag//Plumbum/Pb//Stanum/Sn</i>	1	1
		(ii)	The distance between magnesium and metal X [metal in e(i)] is far apart in the Electrochemical Series/ Metal X is less electropositive than iron. <i>Jarak antara magnesium dan logam X [logam dalam e(i)] adalah lebih jauh dalam Siri Elektrokimia/ Logam X adalah kurang elektropositif berbanding ferum.</i>	1	1
	(f)	(i)	Orange/Lemon/Lime/Pineapple/Tomatoes <i>Oren/Lemon/Limau/Nanas/Tomato</i>	1	1
		(ii)	Contain electrolyte/acid/ H^+ ions Have freely moving ion <i>Mengandungi elektrolit/asid/ion H^+ Mengandungi ion-ion yang bebas bergerak</i>	2	2
Total marks				10	

ANSWER ESSAY QUESTION
JAWAPAN SOALAN ESEI

Question No			Mark Scheme	Mark	
				Sub	Total
1	(a)		P – Carbon anode / <i>anod carbon</i>	1	6
			Q – Carbon cathode / <i>katod karbon</i>	1	
			R – Molten aluminium oxide / <i>Leburan aluminium oksida</i>	1	
			S – Molten aluminium / <i>Leburan aluminium</i>	1	
			Half equation / <i>Persamaan setengah :</i> $\text{Al}^{3+} + 3\text{e} \longrightarrow \text{Al}$	1 1	
	(b)		Cryolite / Kriolit	1	2
			To reduce / lower the melting point of aluminium oxide. <i>Untuk mengurangkan / merendahkan takat lebur aluminium oksida</i>	1	
	(c)		Improve appearance of metals <i>Meningkatkan penampilan logam</i>	1	2
			Prevent rusting/corrosion <i>Mengelakkan pengaratan / kakisan</i>	1	
	(d)		Materials: Impure copper plate and pure copper plate, copper(II) sulphate solution	1	10
			<i>Bahan-bahan : Kepingan kuprum tak tulen dan kepingan kuprum tulen, larutan kuprum(II) sulfat</i>	1	
			Apparatus : Batteries, connecting wire with crocodile clips, ammeter, rheostat, beaker		
			<i>Radas : Bateri, Wayar penyambung dengan klip buaya, ammeter, reostat dan bikar</i>		
			Diagram / <i>Rajah:</i>	1	
			Functional diagram / <i>Gambarajah berfungsi</i>	1	
			Correct label / <i>Label betul</i>		
			Procedure/ <i>Prosedur:</i>		
			1. Impure copper plate is made the anode <i>Kepingan kuprum tak tulen diletakkan sebagai anod</i>	1	
			2. Pure copper plate is made the cathode <i>Kepingan luprum tulen diletakkan sebagai katod</i>	1	
			3. Both plates/electrodes are dipped/immersed into copper(II) sulphate solution <i>Kedua-dua kepingan/elektrod dicelup ke dalam larutan kuprum(II) sulfat.</i>	1 1	

		<p>4. The circuit is completed by allowing the electric current to flow through the electrolyte. <i>Litar dilengkapkan dengan membenarkan arus elektrik mengalir melalui elektrolit.</i></p> <p>Observation/Pemerhatian:</p> <p>Anode/Anod: Impure copper plate become thinner <i>Kepingan kuprum tak tulen menipis</i> $\text{Cu} \longrightarrow \text{Cu}^{2+} + 2\text{e}$</p> <p>Cathode / Katod: Pure copper plate become thicker <i>Kepingan kuprum tulen menebal</i> $\text{Cu}^{2+} + 2\text{e} \longrightarrow \text{Cu}$</p>	1 1 1 1	
Total marks			20	

Question			Marking scheme	Mark	
				Sub	Total
2	(a)		Method 1 <i>Kaedah 1</i>	1	5
			Reason/Alasan:		
			<ul style="list-style-type: none"> The king's crown is a piece of jewellery of high quality <i>Mahkota Diraja adalah sebuah barang perhiasan yang berkualiti tinggi.</i> 	1	
			<ul style="list-style-type: none"> Existing damage should be remove first <i>Kerosakan sedia ada perlu dikeluarkan terlebih dahulu</i> 	1	
			<ul style="list-style-type: none"> Method 1 can increase the quality of the crown <i>Kaedah 1 dapat meingkatkan kualiti mahkota tersebut</i> 	1	
			<ul style="list-style-type: none"> And make it last long <i>Dan dapat bertahan lama</i> 	1	
			<ul style="list-style-type: none"> However, the cost of repair is high, but is worth it because it can last for a long time <i>Walau bagaimanapun, kos untuk memperbaiki rupa bentuk adalah tinggi, namun berbaloi untuk jangka masa yang lama.</i> 		
	(b)		By using the electroplating method <i>Dengan menggunakan kaedah penyaduran logam</i>	1	12

			Label/Label Functional diagram/Rajah berfungsi:	1 1	
			1. The pure gold electrode is connected to the positive terminal of the power supply/battery by using connecting wires <i>Elektrod emas tulen disambung kepada terminal positif bateri menggunakan wayar penyambung.</i>	1	
			2. The crown is connected to the negative terminal of batteries by using connecting wire. <i>Mahkota disambungkan ke terminal negative bateri menggunakan wayar penyambung.</i>	1	
			3. Dip the pure gold electrode and crown into aurum(II) nitrate solution. <i>Celupkan elektrod emas tulen dan mahkota ke dalam larutan aurum(II) nitrat.</i>	1	
			4. Complete the circuit <i>Lengkapkan litar</i>	1	
			5. Anode/Anod:	1	
			Observation / Pemerhatian:		
			The pure gold electrode become thinner <i>Elektrod emas tulen menipis</i>	1	
			Half equation/Persamaan setengah:		
			$\text{Au} \longrightarrow \text{Au}^{2+} + 2\text{e}$	1	
			6. Cathode/Katod:		
			Observation / Pemerhatian:		
			The crown is coated with a golden yellow colour <i>Mahkota diselaputi dengan warna kuning keemasan</i>	1	
			$\text{Au}^{2+} + 2\text{e} \longrightarrow \text{Cu}$	1	
			To get jewellery with high quality, a low current is used during the elctrolysis process which takes place and the bracelet/necklace is rotated slowly all the time.	1	
			<i>Untuk mendapatkan barang kemas yang berkualiti tinggi, arus yang rendah digunakan dan gelang/rantai sentiasa diputar secara perlahan-lahan.</i>		
	(c)	(i)	L, K, J, Cu	1	4
		(ii)	Cu Distance J is closer to L <i>Jarak J lebih dekat dengan L</i>	1 1	
		(iii)	1.3V	1	

	Total marks	21
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